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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/777,908	02/12/2004	Philip Lee Langdale	AUS920030740US1	6084
40412 7590 08/14/2008 IBM CORPORATION- AUSTIN (JVL) C/O VAN LEEUWEN & VAN LEEUWEN PO BOX 90609 AUSTIN, TX 78709-0609				
EXAMINER				
RAMPURIA, SATISH				
ART UNIT		PAPER NUMBER		
2191				
MAIL DATE		DELIVERY MODE		
08/14/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/777,908

**Applicant(s)**

LANGDALE ET AL.

**Examiner**

SATISH S. RAMPURIA

**Art Unit**

2191

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5-10,12-16 and 18-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-10,12-16 and 18-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***DETAILED ACTION***

1. This action is in response to the amendment filed on 06/09/2008.
2. Claims cancelled by the Applicants: 4, 11, 17.
3. Claims amended by the Applicants: 1, 5, 8, 12, 14-16, 18-20.
4. Claims 1-3, 5-10, 12-16, 18-20 are pending.

***Response to Arguments***

5. Applicant's arguments with respect to claim 06/09/2008 have been considered but are moot in view of the new ground(s) of rejection.
6. In response to arguments with respect to claims [[6]] 7, 13 and 20 rejected under 112 second paragraph that the term "third time" used to note that the preceding branching limitation is the third time. Examiner respectfully disagrees. First, It is not clear to the examiner what preceding branching instructions are applicants referring to. Second, in order for third to appear the first and second must appear before. Since the term "third time" still appears to lack antecedent basis, the claims still stand rejected.

***Specification***

7. The objection to specification is withdrawn in view of Applicant's amendment.

***Claim Objections***

8. The objection to Claim 15, 16, 17 is withdrawn in view of Applicant's amendment.

***Claim Rejections - 35 USC § 101***

9. The rejection under 35 U.S.C. §101 to claims 14-20 is withdrawn in view of Applicant's amendment.

***Claim Rejections - 35 USC § 112***

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7, 13 and 20 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7, 13 and 20 recites the limitation "a third time". There is insufficient antecedent basis for this limitation in the claim.

Clarification and/or correction are required.

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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12. Claims 1-3, 5-10, 12-16, 18-20 rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 2002/0144240 to Lueh et al. (hereinafter, Lueh) in view of US Publication No. 2004/0167945 to Garthwaite (hereinafter, Garthwaite).

**Per claim 1:**

Lueh discloses:

1. A computer implemented method of reclaiming memory occupied by Just-in-Time (JIT) compiled programs (Abstract), said method comprising:

tracking a JIT compiled program, the tracking recording tracking data that includes a method name corresponding to the JIT compiled program and an address range that corresponds to the JIT compiled program (paragraph [0029] "...method table... set to a reference compilation...JIT 308...");

discarding one or more memory pages included in the address range (paragraph [0030] "method table... discard the method's stack frame (i.e., memory page)");

branching to an address included in one of the discarded pages, the branching resulting in a page fault (paragraph [0031-0032] upon the exceeds (i.e., fault) defined threshold the reclaim method invoked);

retrieving the method name corresponding to the address that resulted in the page fault (paragraph [0031] "method table... containing an entry... each method of... offset"); and

executing a method corresponding to the retrieved method name (paragraph [0032] "Following the threshold check and conditional native code reclamation, a compilation

routine 613 is performed which in turn invokes JVM dynamic compilation of the presently-invoked method").

memory mapping the JIT compiled program from a nonvolatile storage location to the address range using a special filesystem (paragraph [0029] " JVM's dynamic compiler, JIT 308, to compile the invoked method's bytecodes into executable native code 416 stored within a native code space 414. The method table entry 408 corresponding to the invoked method is then updated to reference the compiled native code 416"); prior to the discarding, receiving, at the special filesystem, an instruction to write (to nonvolatile storage) the one or more memory pages that are about to be discarded (paragraph [0030] " Java virtual machine pops and discards the method's stack frame and the frame for the previous method becomes the current frame 508") [Here Lueh does not explicitly disclose a filesystem, however, since the system of Lueh uses JIT compiler, it is reasonable to conclude that it would be obvious to one skill in the art that JIT compiler is using a filesystem to allow reclaiming the memory space (paragraph [0032]) for faster execution.]

Lueh does not explicitly disclose returning a response indicating successful completion of the instruction without writing any of the pages to the nonvolatile storage location.

However, Garthwaite discloses in an analogous computer system returning a response indicating successful completion of the instruction without writing any of the pages to the nonvolatile storage location (paragraph [0137] "Block 216 represents branching on whether the evacuation was successful. If it was not, a forwarding pointer

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will have been left in the already-evacuated object's previous location, and, as block 218 indicates, the collector will simply update the reference without duplicating the evacuation of the object to which it refers").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of returning a response indicating successful completion of the instruction without writing any of the pages to the nonvolatile storage location as taught by Garthwaite into the method of managing memory in a data processing as taught by Lueh. The modification would be obvious because of one of ordinary skill in the art would be motivated to returning a response indicating successful completion of the instruction without writing any of the pages to the nonvolatile storage location to provide dynamically allocation of memory use as suggested by Garthwaite (paragraph [0013]).

**Per claim 2:**

The rejection of claim 1 is incorporated and further, Lueh discloses:

2. The method of claim 1 wherein executing the method further comprises: recompiling the method using a JIT compiler, the recompiling resulting in a replacement JIT compiled program stored at the recorded address range, wherein the executed method is the replacement JIT compiled program (paragraph [0032] "recompile their associated bytecode...").

**Per claim 3:**

The rejection of claim 1 is incorporated and further, Lueh discloses:

3. The method of claim 1 wherein executing the method further comprises:

removing the method name and the corresponding address range from the tracking data (paragraph [0034] "the method table entries of each "reclaimed" method may then be updated to reference an appropriate stub ");

retrieving an interpretable form of the method; and interpreting code included in the interpretable form of the method (paragraph [0032] "The method table entry 608 corresponding to the currently-invoked method may then be updated (i.e., add, delete, etc.) as described with reference to FIG. 4 to reference").

**Per claim 5:**

The rejection of claim 4 is incorporated and further, Lueh discloses:

Lueh discloses in response to the page fault, calling the special filesystem to load the one or more discarded memory pages from the nonvolatile storage location as applied above to claim 1.

registering an error handler to handle a specific invalid operation code (opcode) prior to discarding any of the memory pages;

writing, by the special filesystem, one or more occurrences of the invalid opcode to one or more of the memory pages that were previously discarded (paragraph [0032] "The



method table entry 608 corresponding to the currently-invoked method may then be updated (i.e., add, delete, etc.) as described with reference to FIG. 4 to reference"); and re-branching to the address that caused the page fault, the re-branching resulting in an invalid opcode exception (paragraph [0032] "corresponding method table entries are updated to re-reference compilation stub 610 just as when the method table 606 ").

**Per claims 6 and 7:**

The rejection of claim 5 is incorporated and further, Lueh discloses:

6. The method of claim 5 further comprising:

executing the error handler in response to encountering the invalid opcode (paragraph [0034] "a runtime helper routine, stop\_all\_threads( ), is invoked which stops and returns all JAVA threads that are currently running (block 706). Next, the stack of each stopped thread is unwound to determine which methods are currently active on each thread (block 708)", wherein the executing includes:

retrieving the address range from the tracking data that includes the address that caused the page fault (paragraph [0034] "reclamation (block 710) the method table entries of each "reclaimed" method may then be updated to reference an appropriate stub (block 712)");

retrieving the method name from the tracking data, wherein the retrieved method name corresponds to the address range (paragraph [0034] "the executable native code associated with each inactive method is then collected or reclaimed (block 710). "); and

re-compiling method code corresponding to the method name so that the re-compiled program is stored at the same address range as the original JIT compiled program (paragraph [0032] "corresponding method table entries are updated to re-reference compilation stub 610 just as when the method table 606 was first created by the JVM so that later invocations of the reclaimed method or methods will invoke the JIT compiler to re-compile their associated bytecode").

**Claims 8-10** are the system claim corresponding to method claims 1-3 respectively, and rejected under the same rational set forth in connection with the rejection of claims 1-3 respectively, above, as noted above.

**Claims 11-13** are the system claim corresponding to method claims 4-7 respectively, and rejected under the same rational set forth in connection with the rejection of claims 4-7 respectively, above, as noted above.

**Claims 14-16** are the computer program product claim corresponding to method claims 1-3 respectively, and rejected under the same rational set forth in connection with the rejection of claims 1-3 respectively, above, as noted above.

**Claims 17-20** are the system claim corresponding to method claims 4-7 respectively, and rejected under the same rational set forth in connection with the rejection of claims 4-7 respectively, above, as noted above.

***Conclusion***

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Satish S. Rampuria** whose telephone number is **(571) 272-3732**. The examiner can normally be reached on **8:30 am to 5:00 pm** Monday to Friday. Any inquiry of a general nature or relating to the status of this application should be directed to the **TC 2100 Group receptionist: 571-272-2100**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Wei Y. Zhen** can be reached on **(571) 272-3708**. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Satish S. Rampuria/  
Patent Examiner, Art Unit 2191

Satish S. Rampuria

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